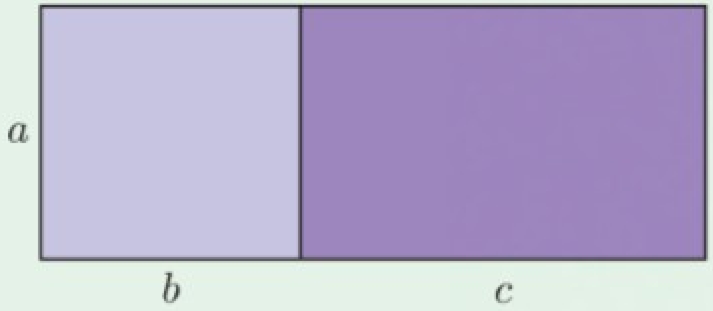
1 Use the diagram alongside to show that $a(b+c) = ab + ac$.



2 Expand and simplify:

a $(x+5)(x-6)$ **b** $(2x+5)(3x-1)$

c $(x+3)(x+2)-(2x-1)(x-6)$

3 Fully factorise:

a $7x^2-4x$ **b** x^3+5x^2-6x **c** $x(x-8)+5(x-8)$

4 Expand and simplify:

a $(x+5)(x-2)(x+1)$ **b** $(2x-3)(x^2+4x+2)$

5 Fully factorise:

a $16-9m^2$ **b** x^3-81x **c** $(x+7)^2-25$

6 Expand and simplify:

a $(t+7)(t-7)$ **b** $(2y+5)(2y-5)$ **c** $(2m-5n)^2$

7 Fully factorise:

a $2x^2+20x+50$ **b** $2b-dc+2d-bc$

8 Use the binomial expansion of $(a+b)^3$ to expand and simplify:

a $(2k+3)^3$

b $(r-4t)^3$

9 Fully factorise:

a $x^2+7x-18$

b $3x^2-9x-30$

c $64-2x^2+8x$

10 Fully factorise:

a $8x^2+10x+3$

b $5x^2-13x+6$

c $-9x^2+3x+2$

11 **a** Show that $(2x+9)^2-(x-3)^2=3x^2+42x+72$ by expanding the LHS.

b Factorise $3x^2+42x+72$ by first taking out a common factor.

c Factorise $(2x+9)^2-(x-3)^2$ using the difference of two squares.

12 **a** Write down the binomial expansion of:

i $(a+b)^2$ **ii** $(a+b)^3$ **iii** $(a+b)^4$ **iv** $(a+b)^5$

b In $(a+b)^2 = a^2+2ab+b^2$, the sum of the coefficients of the expansion is $1+2+1=4$.
Find the sum of the coefficients in the expansion of:

i $(a+b)^3$ **ii** $(a+b)^4$ **iii** $(a+b)^5$

c What do you suspect is the sum of the coefficients in the expansion of $(a+b)^n$?

d Prove your result by letting $a=b=1$.

1 Show that the total area equals the sum of the two smaller areas.

2 **a** $x^2 - x - 30$ **b** $6x^2 + 13x - 5$ **c** $18x - x^2$

3 **a** $x(7x - 4)$ **b** $x(x - 1)(x + 6)$ **c** $(x - 8)(x + 5)$

4 **a** $x^3 + 4x^2 - 7x - 10$ **b** $2x^3 + 5x^2 - 8x - 6$

5 **a** $(4 + 3m)(4 - 3m)$ **b** $x(x + 9)(x - 9)$
c $(x + 12)(x + 2)$

6 **a** $t^2 - 49$ **b** $4y^2 - 25$ **c** $4m^2 - 20mn + 25n^2$

7 **a** $2(x + 5)^2$ **b** $(b + d)(2 - c)$

8 **a** $8k^3 + 36k^2 + 54k + 27$ **b** $r^3 - 12r^2t + 48rt^2 - 64t^3$

9 **a** $(x-2)(x+9)$ **b** $3(x+2)(x-5)$ **c** $-2(x+4)(x-8)$

10 **a** $(4x + 3)(2x + 1)$ **b** $(5x - 3)(x - 2)$
c $-(3x + 1)(3x - 2)$

11 **b** $3(x + 2)(x + 12)$
c $(2x + 9 + x - 3)(2x + 9 - x + 3) = 3(x + 2)(x + 12)$

12 **a** **i** $a^2 + 2ab + b^2$ **ii** $a^3 + 3a^2b + 3ab^2 + b^3$
iii $a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4$
iv $a^5 + 5a^4b + 10a^3b^2 + 10a^2b^3 + 5ab^4 + b^5$
b **i** 8 **ii** 16 **iii** 32 **c** 2^n
d From **12 a**, we see that if $a = b = 1$ in these four expansions, we obtain results of $4 = 2^2$, $8 = 2^3$, $16 = 2^4$, and $32 = 2^5$.
Letting $a = b = 1$ in $(a+b)^n$ we get $(1+1)^n = 2^n$.